**| | | The Thermophilic Farm | | |**

A forest of color

Green Orange Red

Transformation

Fun lies ahead

Vibrant by day

Glowing by dark

An interesting experiment

A lively landmark

Organic and futuristic

Lie sit or stand

Much to learn

Where will you land

*The Thermophilic Farm is a design proposal for Fly Ranch, Nevada. It not only generates beauty through color but produces biofuel, livestock feed and pharmaceutical products. Algal Photobioreactors are used to sustain algae and photosynthesis to generate byproducts. The colors are dictated by the Thermophilic Algae, which grows on Fly Geyser. The farm aims to create an educational and research-based community for learning more about these unique organisms. The interactive design allows for group gatherings and individual experiences. From a research exploration by day to a glowing hub by night, the The Thermophilic Farm will produce clean energy and absorb CO2 from the atmosphere.*

The Thermophilic Farm is sprouts of Algal Photobioreactors, uniquely Thermophilic Algal Photobioreactors. These photobioreactors are populated by Thermophilic Algae. The heat loving organisms have the strong ability to generate various byproducts through photosynthesis. Thermophilic algae yield vibrant colors in which correspond to independent byproducts. These byproducts consist of biofuel, livestock feed and pharmaceuticals. The farm is located on the south end of Fly Ranch. It is the opposing anchor to Fly Geyser, nature’s host for these intelligent and colorful organisms. The technological artwork is placed at the opposing end to respect the natural landmark of the geyser.

The photobioreactors contain the algae while showcasing the color cycle. The colors dictate their life cycle as they adapt to various environments. Factors such as light, heat, and salinity create these environments. The ever-growing technology allows for the production of clean energy and the absorption of CO2 from the atmosphere. Technological advances paired with the colors of nature create a research based beautiful exploration like no other.

Typical photobioreactors serve as a piece of equipment. The Thermophilic Farm’s photobioreactors are different. They take on various shapes for a multitude of activities. Whether one wants to lie, sit or stand, the possibilities are endless. The varied nature of the farm allows for independent study or group gatherings. The research-based environment allows for curious minded individuals to interact with the technology while learning. One is encouraged to hop around from color to color.

The farm is a research journey by day and a glowing hub by night. The beauty of the color of algae can be appreciated during the day. The algae's glowing capabilities can be admired at night. The sparged gas and bubbles creates its own visual story. Whether meandering around or resting, there is beauty to see and feel. The warmth of the technology is like that of heated furniture. As the cold desert night hits, the glowing farm creates comfort. The ability for one to connect to nature through a highly scientific experiment is distinctively exciting.

Furthermore, the thermophilic algal photobioreactors are made up of various elements. For algae to thrive, they need to be encased in glass or plastic. Due to high temperatures, thermophilic algal photobioreactors should be made with glass (borosilicate glass). The base of the tubes is made with recycled metal to host the highly necessary element called the sparger. The sparger allows the carbon dioxide to flow through the medium to sustain algae growth. Attached to the sparger is the impeller which is made from metal as well. The impeller agitates the medium as it is important for the water and algae to be turbulent. Any dead or stagnant space can cause failure to thrive.

Water and heat are two other factors that ignite the growth process. Water may be sourced from local wetlands. Since the system is a closed loop, the need for water is limited. This means that the water sourced from the local wetlands will not impact the environment greatly. The sun is used for light and photosynthesis. It also generates the heat. To maintain the heat specific to the color gradients, a heat exchanger is needed. The algae grow much like the algae on the geyser, only this system allows for a controlled color output. The byproduct is stored at a harvesting station that is made from recycled metals. Any connections from tube to tube or tube to harvesting is made using pvc piping.

To maintain the system, general monitoring by a team would be ideal. Since the system is closed, once it is running, the only upkeep would be monitoring for malfunctions and harvesting outputs. A driven team of scientists and curious individuals for research would promote the growth of the system. The artwork is an emerging technology that allows for a vast amount of exploration within the field of sustainability.

Over more, the farm generates biofuel (50%) for energy purposes, livestock feed (25%) and pharmaceuticals (25%). The cycle goes from green (biofuel) to orange (livestock feed) to red (pharmaceuticals). Each step in the cycle is heated to its own degree. Also, each step has a harvesting station. There are a total of 268 green coded, 73 orange coded, and 85 red coded tubes. The chart below shows this is greater detail.

|  |  |  |  |
| --- | --- | --- | --- |
| Volume of Tubes (cubic cm) | Amount of Green | Amount of Orange | Amount of Red |
| 18,284 | 13 | 5 | 5 |
| 2,081 | 58 | 20 | 20 |
| 7,559 | 93 | 37 | 32 |
| 2,164 | 104 | 11 | 28 |
| TOTAL VOLUMES: | 1,286,433 cm^3 | 436,587cm^3 | 435,520cm^3 |

Conversions:

* Green (Biofuel) 1,286,433 cm^3 ---> 1286.433 liters
* Orange (Livestock Feed) 436,587cm^3 ---> 436.587 liters
* Red (Pharmaceuticals) 435,520cm^3 ---> 435.52 liters
* Total amount= 2,158.54 liters of algae

Production:

* Biomass (Biofuel) yield can be approximately 2 to 3 gram/L per day
  + 1286.433 liters x 2.5 grams = 3,216.083 grams of biomass a day
  + 3,216.083 grams x 365 days = 1,173,870.3 grams of biomass a year
  + Biomass Annual Yield = approximately 1 metric ton
* Livestock Feed/ Pharmaceutical Byproducts
  + With an approximate similar byproduct yield to biomass
  + Orange (Livestock Feed)
    - 436.587 liters x 2.5 grams x 365 days = 393,385 grams of livestock feed a year
  + Red (Pharmaceuticals)
    - 435.52 liters x 2.5 grams x 365 days = 397,412 grams of pharmaceutical byproduct a year
* The variation of byproduct results is tremendous outcomes for sustainable and research-based explorations.

In addition to the information above, in order to produce such large-scale production using algal photobioreactors, many factors need to be considered. The average commercial algal photobioreactor production could be on upwards to over $50 million dollars of investment. With the emerging technology having multiple rewarding byproducts, it would take just a couple of years to exceed the money invested.

More importantly, the culture created would be the first of its kind. The Thermophilic Farm would be the first large scale production of thermophilic algae ever. Production has been proven to work in laboratory settings. The magnificent idea of these colored organisms creating a space for research and learning reflects upon the study of the geyser itself. Thermophilic algae are beautiful and intelligent creatures. The world deserves to learn more about them while appreciating their beauty.

The Thermophilic Farm is an artwork that not only creates a multitude of experiences, but it produces environmentally friendly byproducts while absorbing CO2 from the atmosphere. Since the earth is heating up, it is important to learn more about ways in which to eliminate the CO2 from the atmosphere because it is trapping the heat in. Whether one wants to learn or wants to rest, The Thermophilic Farm allows for just that. From a distance, the field of color emulates a farm landscape. The tubes are like sprouting crops but as you appear closer, the learning opportunities are limitless.

For real life investigating, a pro-type model would consist of a limited number of photobioreactors. What is important to investigate and learn more about is the changing of colors. Perhaps a section of the design that envelopes all three colors could be chosen. In that section, the variety of interactive tubes is essential. A pro-type should consist of all three stages of color with variations of the scale. The luminescent characteristic of these heat loving organisms could be easily monitored on a smaller pro-type model. What is essential is that one can learn about the organism’s colors while interacting with the model. Having the harvest collection space exposed to individuals to view is important so one can learn that these organisms generate eco-friendly byproducts.

The Thermophilic Farm is a lively landmark and large-scale experiment. One may lie, sit, or stand when interacting with it. The colors are vibrant, and the algae is flowing. One may stop to learn, or one may meander around. Not only is it organic and futuristic, but it is a field of fun. Where will you land?